

## CLAIMS

1. A reaction apparatus comprising a heat exchanger 5 and a reactor 1 with a heater 2, which are enclosed in an outer 5 casing 6, the top of the heat exchanger 5 being connected to the reactor 1, the other end part of the heat exchanger 5 and the bottom of the outer casing 6 being fixed to each other by a flange 4, and a double piping 7 for introducing a gas to be treated and discharging the treated gas being connected to 10 the other end part of the heat exchanger 5, such that the gas passes through the heat exchanger 5, the reactor 1 and the heat exchanger 5 in this order during the process from introducing gas through one of the inner tube and the outer tube in the double piping to discharging the gas through the 15 other tube.

2. The reaction apparatus as claimed in claim 1, wherein the heat exchanger 5 is a shell and tube-type heat exchanger.

20 3. The reaction apparatus as claimed in claim 1, wherein the outer casing 6 has an eyebolt fixing part 9 on the ceiling part, thereby the outer casing 6 is detachable.

4. The reaction apparatus as claimed in claim 1, wherein

the reactor 1 has fins 13 in the inside thereof.

5. The reaction apparatus as claimed in claim 1, wherein  
the fins 13 are provided inside the inner tube 7a in the  
5 double piping 7 and/or between the inner tube 7a and the  
outer tube 7b in the double piping 7.

6. The reaction apparatus as claimed in claim 1,  
comprising a mechanism where the gas to be treated is  
10 introduced through the inner tube 7a and discharged through  
the outer tube 7b.

7. The reaction apparatus as claimed in claim 6, wherein  
the outer tube 7b of the double piping 7 has a heat radiating  
15 plate.

8. The reaction apparatus as claimed in claim 1, wherein  
the reaction apparatus is adapted to be installed  
horizontally and the reactor 1 with a heater 2 and the heat  
20 exchanger 5 are placed horizontally with respect to each  
other.

9. A reaction method comprising passing a gas to be  
treated sequentially into one tube of the inner tube 7a and

the outer tube 7b in a double piping 7, a heat exchanger 5, a reactor 1 with a heater 2, the heat exchanger 5 and the other tube in the double piping 7 in this order and heating the gas to be treated by the heater 2 before the gas to be treated is 5 introduced into the reactor 1, thereby adjusting the temperature difference in the gas flow direction inside the reactor 1.

10. The reaction method as claimed in claim 9, wherein the 10 gas to be treated is introduced through the inner tube 7a of the double piping 7 and discharged through the outer tube 7b.

11. The reaction method as claimed in claim 9 or 10, wherein the temperature difference is adjusted to 50°C or 15 less.